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TITLE: INJECTION MOLDED FORM AND MOLDING METHOD OF THE SAME

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ABSTRACT:

PROBLEM TO BE SOLVED: To provide an injection molded form having a configuration capable of providing a sink mark at a place whereat the sink mark is required and transferring mirror surfaces surely at places whereat the transfer of mirror surfaces is required, in molding the injection molded form by employing an injection molding tool.

SOLUTION: An injection molded form 1 is molded by an injection molding tool 10
constituted so as to generate a pressure difference or an air pressure between a mirror surface part, corresponding to the mirror surface of a molding material 20 and a venting port unit, corresponding to the venting port 18 of the same, to generate a sink mark in the venting port part. In such an injection molded form 1, steps 6 are provided between the venting port 18 and the mirror surface parts 2, 3 in the cavity 17 of the injection molding tool

10. Concretely, the steps 6, intercepting between the venting port 18 and the mirror surfaces 2, 3, are provided on a surface 4 at the venting port side of the injection molding molded form 1 whereby the area of sink mark ca be controlled so as to be in the steps and the arrival of sink mark at the mirror surfaces 2, 3 can be prevented.

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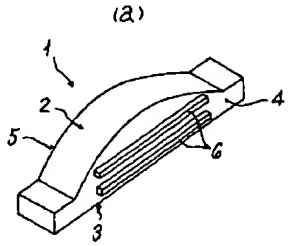
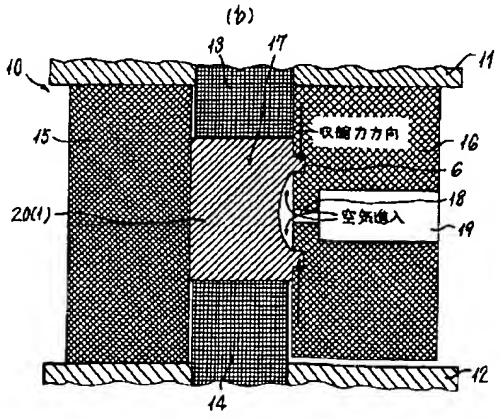
(54)【発明の名称】　射出成形品及びその成形方法

(57)【要約】

【課題】射出成形金型を用いて射出成形品を成形する際に、ひけさせたい個所のみをひけさせ、鏡面を転写させたい個所は確実に転写させることができる形状を有する射出成形品を提供する。

【解決手段】本発明は、成形材料２０の鏡面に対応する鏡面部と通気口１８に対応する通気口部との間に圧力差あるいは空気圧を発生させ、該通気口部にひけを発生させる構成の射出成形金型１０によって形成される射出成形品１において、射出成形金型１０のキャビティ１７内の通気口１８と鏡面部２，３の間に段差６を設ける。具体例としては、射出成形品１の通気口側の面４に、通気口１８と鏡面２，３の間を遮る段差６を設けることにより、ひけの領域を段差内に制御でき、鏡面２，３にひけが達することが防止される。





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【特許請求の範囲】

【請求項1】所定容積のキャビティを画成する成形面と、該成形面に少なくとも1つ以上形成され成形品に鏡面を転写する転写面と、前記成形面に開口しキャビティ内に溶融した成形材料を射出充填するゲートと、を有する一対の金型からなり、キャビティ内に溶融した成形材料がゲートを介して射出充填され冷却されて成形品を成形する射出成形金型であって、前記成形面の転写面外に、所定面積で開口する少なくとも1つ以上の通気口と、該通気口に連通して成形材料に所定の空気圧を付与する少なくとも1つ以上の連通孔とが設けられ、成形材料の鏡面に対応する鏡面部と通気口に対応する通気口部との間に圧力差を発生させ該通気口部にひけを発生させることを特徴とする射出成形金型、または、前記連通孔と通気口を介して所定の空気圧を成形材料の前記通気口部に付与するように空気を送り込む圧縮装置に連結可能に形成し、成形材料の鏡面に対する鏡面部と通気口に対応する通気口部との間に空気圧を発生させ該通気口部にひけを発生させることを特徴とする射出成形金型、によって成形される射出成形品において、
キャビティ内の通気口と鏡面部の間に段差を設けたことを特徴とする射出成形品。

【請求項2】前記通気口側の面に段差を設けたことを特徴とする請求項1記載の射出成形品。

【請求項3】前記通気口と鏡面部の間を遮るように段差を設けたことを特徴とする請求項1または2記載の射出成形品。

【請求項4】前記通気口を取り囲むように段差を設けたことを特徴とする請求項1または2記載の射出成形品。

【請求項5】前記通気口側の側面形状と略相似形状の段差を設けたことを特徴とする請求項1または2記載の射出成形品。

【請求項6】前記段差を凸状にしたことを特徴とする請求項1記載の射出成形品。

【請求項7】前記段差を凹状にしたことを特徴とする請求項1記載の射出成形品。

【請求項8】前記鏡面部側に段差を設けたことを特徴とする請求項1記載の射出成形品。

【請求項9】前記鏡面部の長手側の面を挟むように段差を設けたことを特徴とする請求項1または8記載の射出成形品。

【請求項10】前記鏡面部の外周を取り囲むように段差を設けたことを特徴とする請求項1または8記載の射出成形品。

【請求項11】テーパー形状の段差を設けたことを特徴とする請求項1記載の射出成形品。

【請求項12】三角形状の段差を設けたことを特徴とする請求項1記載の射出成形品。

【請求項13】円弧状の段差を設けたことを特徴とする請求項1記載の射出成形品。

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【請求項14】前記段差を0．1mm以上にしたことを特徴とする請求項1記載の射出成形品。

【請求項15】所定容積のキャビティを画成する成形面と、該成形面に少なくとも1つ以上形成され成形品に鏡面を転写する転写面と、前記成形面に開口しキャビティ内に溶融した成形材料を射出充填するゲートと、を有する一対の金型からなり、キャビティ内に溶融した成形材料をゲートを介して射出充填され冷却されて成形品を成形する射出成形金型であって、前記成形面の転写面外に、所定面積で開口する少なくとも1つ以上の通気口と、該通気口に連通して成形材料に所定の空気圧を付与する少なくとも1つ以上の連通孔とが設けられ、成形材料の鏡面に対応する鏡面部と通気口に対応する通気口部との間に圧力差を発生させ該通気口部にひけを発生させることを特徴とする射出成形金型、または、前記連通孔と通気口を介して所定の空気圧を成形材料の前記通気口部に付与するように空気を送り込む圧縮装置に連結可能に形成し、成形材料の鏡面に対する鏡面部と通気口に対応する通気口部との間に空気圧を発生させ該通気口部にひけを発生させることを特徴とする射出成形金型、によって成形品を成形する成形方法において、
キャビティ内の樹脂圧力が0になるよりも時間を長く通気口を介して空気圧を発生させることを特徴とする射出成形品の成形方法。

【請求項16】空気圧は大気圧（約0．1MPa）以上、2MPa以下であることを特徴とする請求項15記載の射出成形品の成形方法。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、射出成形金型によって成形されるプラスチック光学素子（レンズ、ミラー、プリズムなど）等の射出成形品及びその成形方法に関する。

【0002】

【従来の技術】従来、所定容積のキャビティを画成する成形面と、その成形面に形成され成形品に鏡面を転写する転写面と、成形面に所定面積で開口するゲートと、を有し、キャビティ内に溶融樹脂がゲートを介して射出充填され冷却されて成形品、例えばミラー、レンズ、あるいはプリズム等のプラスチック光学素子を高精度に成形する射出成形金型が知られている。この種の射出成形金型によって成形される成形品で特に光学素子には高精度な鏡面や屈折率の均一性が要求されているが、溶融樹脂が固化する際の収縮により面精度が必要な鏡面にひけが生じてしまうという不具合があった。

【0003】このような不具合を解消するための従来技術としては、例えば、特開平3－128218号公報、特開平8－234005号公報、特開平3－151218号公報、または特開平3－281213号公報に記載された射出成形金型と成形方法がある。この射出成形金

型とその金型を用いた成形方法では、①：転写面に対向する成形面を粗面にして、キャビティ内への溶融樹脂の充填完了の直前に射出を停止し保圧を加えることなく冷却固化することにより溶融樹脂と転写面及び粗面との密着力の差によって粗面側にひけを発生させ、鏡面にひけが発生することを防止するようになっている。また、特開平３－１５１２１８号公報には、②：転写面に対向する成形面を粗面にするとともに余剰溶融樹脂が流入するオーバーフロー部をキャビティ外に設け、オーバーフロー部への充填が開始した時点で射出を停止し保圧を加えることなく冷却固化することにより溶融樹脂と転写面及び粗面との密着力の差によって粗面側にひけを発生させる射出成形金型と成形方法が記載されている。

【０００４】しかしながら、このような従来例にあっては、金型の転写面に対向する成形面を粗面にするため、鏡面を片面のみ必要とする光学素子（例えばミラー）は成形可能であるが、鏡面の形成位置及び鏡面数が制限されてしまい、例えばレンズまたはプリズム等の光学素子を成形することは不可能である。また、転写面及び粗面を構成する材質及び溶融樹脂の材料によっては密着力が逆転し鏡面にひけが生じてしまうという問題があった。また上記の①においては、充填完了の直前に射出を停止することは非常に難しく停止するタイミングがずれると転写面及び粗面の密着力が逆転して鏡面にひけが生じたり、溶融樹脂が不足してしまう。また、上記の②においては、溶融樹脂の充填を停止するタイミングの時間的範囲を拡げることは可能であるが、成形品にオーバーフロー部が一体に成形されるためそのオーバーフロー部を取り除く工程が必要となり、コスト高になってしまうとともに、オーバーフロー部へ溶融樹脂を流入させるゲートの開口面積が小さすぎると転写面及び粗面の密着力が逆転して鏡面にひけが生じたり、大きすぎると溶融樹脂が不足してしまうという問題があった。

【０００５】そこで、このような問題を解消するため、本出願人は先に、成形材料の鏡面部と所定個所との間に空気圧力差を発生させることにより成形材料の管理を厳しくすることなく成形品の鏡面外にひけを発生させて、内部歪みのない高精度な鏡面を有する成形品を成形可能な射出成形金型を提供した（特開平６－３０４９７３号公報）。

【０００６】この射出成形金型は、所定容積のキャビティを画成する成形面と、該成形面に少なくとも１つ以上形成され成形品に鏡面を転写する転写面と、前記成形面に開口しキャビティ内に溶融した成形材料を射出充填するゲートと、を有する一対の金型からなり、キャビティ内に溶融した成形材料がゲートを介して射出充填され冷却されて成形品を成形する射出成形金型において、前記成形面の転写面外に、所定面積で開口する少なくとも１つ以上の通気口と、該通気口に連通して成形材料に所定の空気圧を付与する少なくとも１つ以上の連通孔と、を設け、成形材料の鏡面に対応する鏡面部と通気口に対応する通気口部との間に圧力差を発生させ該通気口部にひけを発生させることを特徴とするものである。すなわち、この射出成形金型によれば、転写面により転写される鏡面外の成形材料に通気口及び連通孔を介して空気を接触させ冷却速度を遅くするとともに所定の空気圧を通気口部に付与し成形材料の鏡面部と通気口部との間に所定の圧力差を発生させるので、通気口部にひけを選択的に発生させることができ、鏡面部にひけを発生させることなく金型の転写面を高精度に転写することができる。また、通気口部にひけを選択的に発生させるので、キャビティ内への成形材料の充填量の制御を簡易にして内部に歪みを発生させることなく成形品を成形することができる。この結果、内部歪みのない高精度な鏡面を有する成形品を容易に成形することができる。

【０００７】また、特開平６－３０４９７３号公報には、前記射出成形金型において、前記連通孔を、前記通気口を介して所定の空気圧を成形材料の前記通気口部に付与するように空気を送り込む圧縮装置に連結可能に形成することが記載されており、このように連通孔を圧縮装置に連結可能に形成することにより、圧縮装置により成形材料の鏡面部と通気口部との間の空気圧力差を任意に発生させ、通気口部にひけを発生させることができる。また、その圧力差も容易に調整することができ、内部歪みを発生させることなくより高精度に鏡面を形成することができる。

【０００８】

【発明が解決しようとする課題】図１２は従来の射出成形金型の一例を示す要部断面図であり、図中の符号１１は固定側金型、１２は可動側金型、１３，１４は成形品に鏡面を転写する転写面を成形面に有する鏡面駒、１５は成形品の基準面（Ｃ面）となる側の成形面を有する基準面側入れ子、１６は成形品のひけさせる面（Ｂ面）となる側の成形面を有するひけさせる面側入れ子であり、これらの金型部品の成形面により所定容積のキャビティ１７が画成される。このキャビティ１７内には図示しないゲートを介して溶融した成形材料（例えば溶融樹脂）２０が射出充填される。また、ひけさせる面側入れ子１６の成形面には、所定面積で開口する通気口１８と、該通気口１８に連通して成形材料２０に所定の空気圧を付与する連通孔１９とが設けられている。図１３は上記ひけさせる面側入れ子１６の成形面（Ｂ面）に形成された通気口１８の一例を示している。尚、通気口１８からの通気は、鏡面部と通気口部との圧力差を利用した自然通気と、連通孔１９に圧縮装置（図示せず）を連結し、圧縮装置により成形材料の鏡面部と通気口部との間の空気圧力差を任意に発生させる強制通気とがある。

【０００９】図１２，１３に示す構成の射出成形金型１０によれば、射出成形品のひけさせたい側に通気口１８を設け、連通孔１９を介して空気をその通気口１８より

キャビティ１７内に進入させる方法により、ひけをその面に誘導することが可能である（詳細は特開平６－３０４９７３号公報参照）。また、射出成形品に鏡面駒１３，１４の鏡面を良好に転写でき、低い内部歪みである射出成形品が得られる。図１４は上記射出成形金型で成形された射出成形品の一例を示す図であり、（ａ）は射出成形品の斜視図、（ｂ）は射出成形品の側面図、（ｃ）は射出成形品のＡ部断面図である。この射出成形品２１は、上記射出成形金型１０の鏡面駒１３，１４により鏡面（光学面）２２，２３が２面に転写された矩形状のレンズ成形品の例であり、（ｂ）に示す側面はそのレンズ成形品２１のひけさせたい側の面（Ｂ面）２４であり、符号２７で示す網線部分が、ひけの領域を示している。また、Ｂ面２４と反対側の面２５は取付け基準面（Ｃ面）である。図１４に示すように、レンズ成形品２１のＢ面２４に狙いのひけを誘導することにより、鏡面２２，２３が良好に転写された内部歪みの低いレンズ成形品が得られる。

【００１０】しかしながら、射出成形金型１０のキャビティ１７は、複数の金型部品１１～１６から構成されており、その部品精度及び組み付け精度が悪い場合は、図１２に示すように金型間に空隙ｄができ、その空隙ｄから空気が進入し、キャビティ１７内への空気の流れ込みがおき、ねらいの面をひけさせることができない場合がある。図１５はキャビティ１７内の基準面（Ｃ面）側への空気の流れ込みがおきた状態で成形されたレンズ成形品の一例を示す図であり、（ａ）はレンズ成形品の側面図、（ｂ）はレンズ成形品のＡ部断面図を示す。図１５に示すように、キャビティ１７内のＣ面側への空気の流れ込みがおきた状態で成形されたレンズ成形品２１では、狙いの面（Ｂ面）側のひけが小さくなり（もしくはひけさせることができず）、最悪の場合にはＢ面２４とは逆のＣ面２５側にひけが発生してしまい、基準面としての面精度が低下する。

【００１１】また、通気口１８から空気を流し込む方法（自然、強制を問わず）では、キャビティ１７内に充填した樹脂量や空気量の設定の違いによって、鏡面部まで空気が進入し、鏡面部までひけさせてしまうことがある。図１６は鏡面部までひけが達したレンズ成形品の一例を示す図であり、（ａ）はレンズ成形品の上面図、（ｂ）はレンズ成形品の側面図、（ｃ）はレンズ成形品のＡ部断面図を示している。射出成形時に鏡面部まで空気が進入し、図１６に示すように、Ｂ面２４に誘導したひけの領域２７が鏡面２２側まで達してしまった場合には、鏡面２２に歪みが生じ、レンズ性能が劣化してしまう。

【００１２】本発明は上記事情に鑑みなされたものであって、先願と同様の射出成形金型を用いて射出成形品を成形する際に、ひけさせたい個所のみをひけさせ、鏡面を転写させたい個所は確実に転写させることができる形状を有する射出成形品と、その射出成形品の成形方法を提供することを目的とする。

【００１３】

【課題を解決するための手段】上記目的を達成するため、請求項１記載の発明は、所定容積のキャビティを画成する成形面と、該成形面に少なくとも１つ以上形成され成形品に鏡面を転写する転写面と、前記成形面に開口しキャビティ内に溶融した成形材料を射出充填するゲートと、を有する一対の金型からなり、キャビティ内に溶融した成形材料がゲートを介して射出充填され冷却されて成形品を成形する射出成形金型であって、前記成形面の転写面外に、所定面積で開口する少なくとも１つ以上の通気口と、該通気口に連通して成形材料に所定の空気圧を付与する少なくとも１つ以上の連通孔とが設けられ、成形材料の鏡面に対応する鏡面部と通気口に対応する通気口部との間に圧力差を発生させ該通気口部にひけを発生させることを特徴とする射出成形金型、または、前記連通孔と通気口を介して所定の空気圧を成形材料の前記通気口部に付与するように空気を送り込む圧縮装置に連結可能に形成し、成形材料の鏡面に対する鏡面部と通気口に対応する通気口部との間に空気圧を発生させ該通気口部にひけを発生させることを特徴とする射出成形金型、によって成形される射出成形品において、キャビティ内の通気口と鏡面部の間に段差を設けたことを特徴とするものである。

【００１４】請求項２記載の発明は、請求項１記載の射出成形品において、前記通気口側の面に段差を設けたことを特徴とするものである。また、請求項３記載の発明は、請求項１または２記載の射出成形品において、前記通気口と鏡面部の間を遮るように段差を設けたことを特徴とするものであり、請求項４記載の発明は、請求項１または２記載の射出成形品において、前記通気口を取り囲むように段差を設けたことを特徴とするものであり、請求項５記載の発明は、請求項１または２記載の射出成形品において、前記通気口側の側面形状と略相似形状の段差を設けたことを特徴とするものである。

【００１５】請求項６記載の発明は、請求項１記載の射出成形品において、前記段差を凸状にしたことを特徴とするものであり、請求項７記載の発明は、請求項１記載の射出成形品において、前記段差を凹状にしたことを特徴とするものである。

【００１６】請求項８記載の発明は、請求項１記載の射出成形品において、前記鏡面部側に段差を設けたことを特徴とするものである。また、請求項９記載の発明は、請求項１または８記載の射出成形品において、前記鏡面部の長手側の面を挟むように段差を設けたことを特徴とするものであり、請求項１０記載の発明は、請求項１または８記載の射出成形品において、前記鏡面部の外周を取り囲むように段差を設けたことを特徴とするものである。

【００１７】請求項１１記載の発明は、請求項１記載の射出成形品において、テーパー形状の段差を設けたことを特徴とするものであり、請求項１２記載の発明は、請求項１記載の射出成形品において、三角形状の段差を設けたことを特徴とするものであり、請求項１３記載の発明は、請求項１記載の射出成形品において、円弧状の段差を設けたことを特徴とするものであり、請求項１４記載の発明は、請求項１記載の射出成形品において、前記段差を０．１mm以上にしたことを特徴とするものである。

【００１８】請求項１５記載の発明は、所定容積のキャビティを画成する成形面と、該成形面に少なくとも１つ以上形成され成形品に鏡面を転写する転写面と、前記成形面に開口しキャビティ内に溶融した成形材料を射出充填するゲートと、を有する一対の金型からなり、キャビティ内に溶融した成形材料をゲートを介して射出充填され冷却されて成形品を成形する射出成形金型であって、前記成形面の転写面外に、所定面積で開口する少なくとも１つ以上の通気口と、該通気口に連通して成形材料に所定の空気圧を付与する少なくとも１つ以上の連通孔とが設けられ、成形材料の鏡面に対応する鏡面部と通気口に対応する通気口部との間に圧力差を発生させ該通気口部にひけを発生させることを特徴とする射出成形金型、または、前記連通孔と通気口を介して所定の空気圧を成形材料の前記通気口部に付与するように空気を送り込む圧縮装置に連結可能に形成し、成形材料の鏡面に対する鏡面部と通気口に対応する通気口部との間に空気圧を発生させ該通気口部にひけを発生させることを特徴とする射出成形金型、によって成形品を成形する成形方法において、キャビティ内の樹脂圧力が０になるよりも時間を長く通気口を介して空気圧を発生させることを特徴とするものである。また、請求項１６記載の発明は、請求項１５記載の射出成形品の成形方法において、空気圧は大気圧（約０．１MPa）以上、２MPa以下であることを特徴とするものである。

【００１９】

【発明の実施の形態】以下、本発明の実施の形態を図面を参照して詳細に説明する。

【００２０】図１７は従来の射出成形品２１と通気口の位置関係を示したものである。このような位置に通気口がある場合、課題のところで述べたように、射出成形金型１０の通気口１８から空気を流し込む方法（自然通気、または連通孔１９を介して圧縮装置を接続した強制通気を問わず）では、キャビティ内に充填した樹脂量や空気量の設定の違いによって、鏡面部まで空気が進入し、図１６に示したように、B面２４に誘導したひけの領域が鏡面２２側まで広がる恐れがある。それを無くすために本発明では、射出成形品を、キャビティ内の通気口と鏡面部の間に段差を設けた形状とする（請求項１）。以下、本発明の実施例を示す。

【００２１】図１は本発明に係る射出成形品とその成形品を成形する射出成形金型の実施例を示す図であり、（ａ）は射出成形品の斜視図、（ｂ）は射出成形金型の要部断面図である。本発明の射出成形品を成形する射出成形金型の基本的な構成は図１２に示したものと同様であり、同じ構成部品には同符号を付してあるが、図１（ｂ）に示す射出成形金型１０では、成形品１に設けられる段差６に対応して、キャビティ１７内の通気口１８と鏡面部の間の成形面に段差が設けられている。図１（ａ）に示す射出成形品１は、レンズ面となる鏡面（光学面）２，３を２面有する矩形状のレンズ成形品であり、通気口１８と鏡面２，３の間で、レンズ成形品１の通気口側のひけさせたい面（B面）４に、通気口１８と鏡面２，３の間を遮る段差６を設けた例である（請求項２，３）。以下その段差の効果を説明する。

【００２２】図１（ｂ）は段差が有る形状の成形品１を成形する射出成形金型１０を示しており、キャビティ１７内の通気口１８と鏡面部の間の成形面に、成形品１側の段差６を形成するための逆形状の段差が設けられている。金型のキャビティ１７内に成形材料である溶融樹脂２０を充填直後は樹脂内圧が高圧力のため、空気はキャビティ１７内に存在することが難しく通気口１８から連通孔１９へ流出する。冷却とともに金型内の樹脂圧力は低下し大気圧または圧縮圧以下（圧縮装置により連通孔１９と通気口１８を介して空気を圧縮注入する場合）になったとき、通気口１８から空気が流入し、樹脂２０は金型の通気口１８から離れ始める（ひけの発生）。この時、成形品に段差が無い場合は、ひけは更に成長を続け、鏡面部まで達成する可能性があるが、図１（ａ）のように成形品１の通気口側のB面４に、通気口と鏡面２，３の間を遮る段差６を設けた形状では、その段差部分は、図１（ｂ）の矢印方向へ収縮しようとする。しかし、金型側の段差と干渉するため、段差部分の収縮は進行しない。よって、樹脂と金型とが密着し、ひけは段差以上に成長せず、ひけの領域を段差内に制御できる。これにより、ひけさせたい個所のみひけさせ、鏡面２，３を確実に転写させたレンズ成形品１が得られる。

【００２３】次に図２は本発明の別の実施例を示す射出成形品の斜視図である。本実施例では、図１（ａ）と同様の形状のレンズ成形品１の通気口側のB面４に、通気口の周りを取り囲むように段差６を配置したものである（請求項４）。このように通気口の周りを取り囲むように段差６を配置することによって、図1（ａ）と比較して、空気の回り込みがなくなり、より確実にひけの領域を制御することができる。

【００２４】次に図３は本発明の別の実施例を示す射出成形品の説明図であって、（ａ）は射出成形品の斜視図、（ｂ）は射出成形品のＡ１部断面図、（ｃ）は射出成形品のＡ２部断面図である。本実施例では、図１（ａ）と同様のレンズ形状の成形品１の通気口側の側面

（Ｂ面）４に、その側面形状と略相似形状の段差６を設けたものである（請求項５）。より具体的には、図３に示すように成形品１が矩形状のレンズの場合、通気口側の面（Ｂ面）４に通気口の周りを取り囲むように、レンズ側面形状と略相似形状の段差６を設ける。これにより、成形品１の各断面（例：図３（ｂ），（ｃ）に示すＡ１，Ａ２部断面）の断面積と同じ割合でひけ領域を制御することができるため、内部歪み及び面精度の均一化が図られ、より高精度なレンズ成形品となる。

【００２５】上記の各実施例では、射出成形品１の段差６の高さ方向の形状は図４（ａ）の断面図に示すような凸状とした例で示したが、同図（ｂ）の断面図に示すような凹状の段差としても、ひけ領域を同様に制御できる効果を持つ（請求項６，７）。ただし、成形品１の通気口側の面（Ｂ面）４に凸状の段差を設ける場合は、射出成形金型１０の通気口１８周辺の成形面には凹状の段差を設けておき、成形品１の通気口側の面（Ｂ面）４に凹状の段差を設ける場合は、射出成形金型１０の通気口１８周辺の成形面には凸状の段差を設けておくことになる。

【００２６】次に、射出成形品の鏡面側に段差を設けた場合について説明する。図５は本発明の別の実施例を示す射出成形品の説明図であって、（ａ）は射出成形品の斜視図、（ｂ）は射出成形品のＡ部断面図であり、射出成形品１のひけさせたい側の鏡面部２，３に段差６を設けた例である（請求項８）。通気口からの空気の進入を遮断するには、図５のように射出成形品１のひけさせたい側の鏡面部２，３に段差６を設けても良く、射出成形時に成形品１の段差６と金型側の段差とが密着するため、鏡面部２，３への空気の進入を防ぐことができ、鏡面部にひけが発生することを防止できる。

【００２７】図６は本発明の別の実施例を示す射出成形品の説明図であって、（ａ）は射出成形品の斜視図、（ｂ）は射出成形品のＡ部断面図であり、射出成形品１のひけさせたい側の鏡面部２，３の一部に段差６を設けた例である。図１６に示したように成形品の鏡面の一部に空気が回り込み、一部分のみにひけが出ることが判っている場合は、図６のように、鏡面部２，３のひけの出る恐れのある個所に設けられた一部分のみの段差６でも構わない。この場合、段差は一部分であるので、金型に段差を形成する際の加工費が安くできる。

【００２８】図７は本発明の別の実施例を示す射出成形品の説明図であって、（ａ）は射出成形品の斜視図、（ｂ）は射出成形品のＡ部断面図であり、射出成形品１の鏡面２，３の長手側の面を挟むように、鏡面２，３のＢ面４側とＣ面５側に段差６を設けた例である（請求項９）。図１２に示したように金型１０の組み付け精度が悪い場合、空気が予測できない個所から進入してくる恐れがあり、例えば図１５に示したように取付基準面（Ｃ面）側に空気が流入し、ひけが発生してしまうようなことがあるが、その空気が鏡面部まで回り込んで、鏡面部にもひけが発生する場合がある。この解決のために図７のように鏡面２，３の両側に段差６を設けることで、鏡面部への空気の回り込みを防止でき、鏡面部にひけが発生することを防止できる。

【００２９】図８は本発明の別の実施例を示す射出成形品の説明図であって、（ａ）は射出成形品の斜視図、（ｂ）は射出成形品のＡ部断面図であり、射出成形品１の鏡面部２，３の外周を取り囲むように段差６を設けた例である（請求項１０）。このように、鏡面部２，３の外周を取り囲むように段差６を設けることで、より確実に空気の進入を防ぐことができ、鏡面部にひけが発生することを確実に防止できる。

【００３０】射出成形品１の鏡面部２，３への空気の進入を防ぐには、図７（ｂ）や図８（ｂ）に示したような段差形状でさえあれば良い。しかし、金型からの離型性を考慮すると、図９に示す実施例のように、段差高さｈに対してテーパー状の抜き勾配の段差６を設けるとよく（請求項１１）、成形品の形状精度を悪化させることなく金型から離型することができる。

【００３１】また、図１０（ａ）に示す実施例のように射出成形品１の鏡面部２，３の両側に三角形状の段差６を設ける（請求項１２）、あるいは図１０（ｂ）に示す実施例のように射出成形品１の鏡面部２，３の両側に円弧状の段差６を設ける（請求項１３）ことにより、離型性の向上の他、鏡面駒１３，１４等、金型側に段差を形成する際の加工を簡単にすることができる。

【００３２】尚、射出成形品１に設けられる段差６の高さｈは、ｈ＝０．１ｍｍ以上とした（請求項１４）。すなわち、本発明者らは、段差高さが０．１ｍｍ以上であれば十分空気遮断の効果が得られることを実験的に確認した。

【００３３】次に本発明に係る射出成形品の成形方法を、図１（ｂ）に示す構成の射出成形金型を使用した例で説明する。まず、鏡面駒１３とひけさせる面側入れ子１６とが装着された固定側金型１１に対して、鏡面駒１４と基準面側入れ子１５が装着された可動側金型１２を密着させ、型締めすることにより、一対の金型の成形面により所定容積のキャビティ１７が画成される。射出成形金型１０の図示されない側の成形面にはキャビティ１７内に溶融した成形材料を射出充填するために外部に連通したゲートが設けられており、該ゲートには図示しない公知の射出充填機が連結され、該射出充填機によりキャビティ１７内に成形材料である溶融樹脂２０が射出充填される。金型１０のキャビティ１７内に成形材料である溶融樹脂２０を充填直後は樹脂内圧が高圧力のため、空気はキャビティ１７内に存在することが難しく、通気口１８から流出する。溶融樹脂２０の冷却とともに金型内の樹脂圧力は低下し大気圧または圧縮圧以下（図示しない圧縮装置により連通孔１９と通気口１８を介して空

気を圧縮注入する場合）になったとき、樹脂20は金型の通気口18から離れ始め、通気口18から空気が流入する（ひけの発生）。この時、例えば図1（a）に示したように、成形品1の通気口側の面（B面）4に鏡面部2，3との間を遮るような段差6を設けた形状では、その段差部分は、例えば図1（b）の矢印方向へ収縮するが、金型側の段差と干渉するため、段差部分の収縮は進行しない。よって、樹脂と金型とが密着し、ひけは段差以上に成長せず、ひけの領域が段差内に制御された成形品を成形できる。

【0034】ここで、図11は、溶融樹脂の充填開始から冷却完了迄の間のキャビティ内の樹脂内圧と、通気口18から圧縮空気を注入する場合の空気圧切り換えタイミングを示す図である。本発明の成形方法では、通気口18から圧縮空気を注入する場合、図11に示すように、キャビティ17内の樹脂内圧が0になった時点以上まで空気を流し続け、通気口部に空気圧を発生させる（請求項15）。本発明者らは、このようにキャビティ17内の樹脂圧力が0になるよりも時間を長く通気口18を介して空気圧を発生させることにより、確実にひけ領域を制御することができることを実験的に確認した。

【0035】キャビティ内の樹脂内圧が0になるまで樹脂は金型に密着しており、それ以上の時間にてひけが成長していくため、内圧0の時点より多少長めに空気圧をかけることが必要であり、例えば、射出成形品1が実施例で示したようなレンズ形状では、樹脂内圧が0となってからさらに5秒以上空気圧をかけることでひけ領域の制御ができた。また、そのときの空気圧は大気圧（約0．1MPa）以上、2MPa以下にて十分な制御が得られる（請求項16）。

【0036】尚、以上に説明した実施例では、射出成形品1として矩形状のレンズ（鏡面（光学面）を2面持つもの）を用いた例を示したが、本発明はこれに限るものではなく、ミラーのように鏡面（光学面）を1つ持つものや、プリズムのように鏡面（光学面）を複数持つものでも同様の考え方、形状の段差を設けることで対処可能である。

【0037】

【発明の効果】以上説明したように、請求項1記載の発明では、成形材料の鏡面に対応する鏡面部と通気口に対応する通気口部との間に圧力差あるいは空気圧を発生させ、該通気口部にひけを発生させる構成の射出成形金型によって形成される射出成形品において、キャビティ内の通気口と鏡面部の間に段差を設けたことにより、樹脂の冷却時に樹脂の収縮が段差部分より進行せず、ひけさせたい面以外の部分の樹脂と金型の密着が維持され、ひけの領域が段差以上に成長せず、ひけの領域を段差内に制御することができる。

【0038】請求項2記載の発明では、射出成形品の、通気口側の面に段差を設けたことにより、ひけの領域を通気口側の面内に制御できる。請求項3記載の発明では、前記通気口と鏡面部の間を遮るように段差を設けたことにより、鏡面にひけが達することを防止できる。請求項4記載の発明では、前記通気口を取り囲むように段差を設けたことにより、鏡面部への空気の回り込みを防止でき、ひけ領域を通気口側の面の段差内に制御でき、鏡面にひけが達することを確実に防止できる。請求項5記載の発明では、前記通気口側の側面形状と略相似形状の段差を設けたことにより、成形品の断面積と同じ割合でひけ領域を制御できるため、内部歪み及び面精度の均一化が図られ、より高精度な成形品が得られる。

【0039】請求項6記載の発明では、射出成形品の段差を凸状とし、請求項7記載の発明では、前記段差を凹状としたが、何れの場合もひけ領域を制御できる効果を得られる。

【0040】請求項8記載の発明では、射出成形品の鏡面部側に段差を設けたことにより、通気口からの空気の鏡面部への進入を遮断でき、鏡面部でのひけの発生を防止できる。請求項9記載の発明では、前記鏡面部の長手側の面を挟むように段差を設けたことにより、通気口からの空気やその他の個所から回り込んでくる空気の鏡面部への進入を遮断でき、鏡面部でのひけの発生を確実に防止できる。請求項10記載の発明では、前記鏡面部の外周を取り囲むように段差を設けたことにより、より確実に鏡面部への空気の進入を防止することができ、鏡面部でのひけの発生をより確実に防止できる。

【0041】請求項11記載の発明では、射出成形品にテーパー形状の段差を設けたことにより、ひけの領域を段差内に制御することができ、かつ、成形品の形状精度を悪化させることなく金型からの離型性を向上することができる。また、請求項12，13記載の発明のように、射出成形品に三角形状や、円弧状の段差を設けることにより、離型性の向上の他、金型側に段差を形成する際の加工を簡単にすることができる。尚、請求項14記載の発明のように、前記段差は0．1mm以上であれば十分空気遮断の効果が得られる。

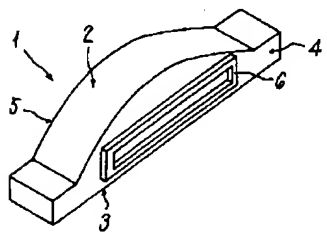
【0042】請求項15記載の発明では、成形材料の鏡面に対応する鏡面部と通気口に対応する通気口部との間に圧力差あるいは空気圧を発生させ、該通気口部にひけを発生させる構成の射出成形金型によって射出成形品を成形する際に、キャビティ内の樹脂圧力が0になるよりも時間を長く通気口を介して空気圧を発生させることにより、確実にひけ領域を制御することができる。また、請求項16記載の発明のように、前記空気圧は大気圧（約0．1MPa）以上、2MPa以下であれば、十分にひけ領域を制御することができる。

【図面の簡単な説明】

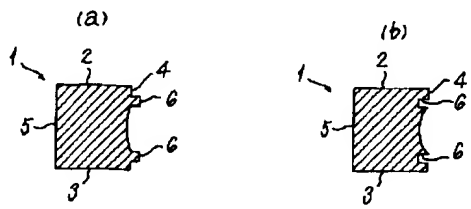
【図1】本発明に係る射出成形品とその成形品を成形する射出成形金型の実施例を示す図であり、（a）は射出成形品の斜視図、（b）は射出成形金型の要部断面図で

ある。
【図２】本発明の別の実施例を示す射出成形品の斜視図である。
【図３】本発明の別の実施例を示す射出成形品の説明図であって、（ａ）は射出成形品の斜視図、（ｂ）は射出成形品のＡ１部断面図、（ｃ）は射出成形品のＡ２部断面図である。
【図４】本発明に係る射出成形品の段差の高さ方向の形状例を示す図である。
【図５】本発明の別の実施例を示す射出成形品の説明図であって、（ａ）は射出成形品の斜視図、（ｂ）は射出成形品のＡ部断面図である。
【図６】本発明の別の実施例を示す射出成形品の説明図であって、（ａ）は射出成形品の斜視図、（ｂ）は射出成形品のＡ部断面図である。
【図７】本発明の別の実施例を示す射出成形品の説明図であって、（ａ）は射出成形品の斜視図、（ｂ）は射出成形品のＡ部断面図である。
【図８】本発明の別の実施例を示す射出成形品の説明図であって、（ａ）は射出成形品の斜視図、（ｂ）は射出成形品のＡ部断面図である。
【図９】本発明の別の実施例を示す図であって、テーパー形状の段差を設けた射出成形品の断面図である。
【図１０】本発明の別の実施例を示す図であって、（ａ）は三角形状の段差を設けた射出成形品の断面図、（ｂ）は円弧状の段差を設けた射出成形品の断面図である。
【図１１】溶融樹脂の充填開始から冷却完了迄の間のキャビティ内の樹脂内圧と、通気口から圧縮空気を注入する場合の空気圧切り換えタイミングを示す図である。
【図１２】従来の射出成形金型の一例を示す要部断面図である。
【図１３】図１２に示す射出成形金型のひけさせる面側入れ子の成形面に形成された通気口の一例を示す平面図である。
【図１４】図１２に示す射出成形金型で成形された射出成形品の一例を示す図であり、（ａ）は射出成形品の斜視図、（ｂ）は射出成形品の側面図、（ｃ）は射出成形品のＡ部断面図である。
【図１５】キャビティ内の基準面側への空気の流れ込みがおきた状態で成形された射出成形品の一例を示す図であり、（ａ）は射出成形品の側面図、（ｂ）は射出成形品のＡ部断面図である。
【図１６】鏡面部までひけが達した射出成形品の一例を示す図であり、（ａ）は射出成形品の上面図、（ｂ）は射出成形品の側面図、（ｃ）は射出成形品のＡ部断面図である。
【図１７】図１２に示す射出成形金型で成形される射出成形品と通気口の位置関係を示す図である。
【符号の説明】
１：射出成形品（レンズ成形品）
２，３：鏡面（光学面）
４：通気口側の面（ひけさせたい面（Ｂ面））
５：取付け基準面（Ｃ面）
６：段差
１０：射出成形金型
１１：固定側金型
１２：可動側金型
１３，１４：鏡面駒
１５：基準面側入れ子
１６：ひけさせる面側入れ子
１７：キャビティ
１８：通気口
１９：連通孔
２０：成形材料（溶融樹脂）

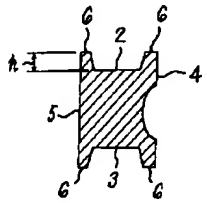
【図2】



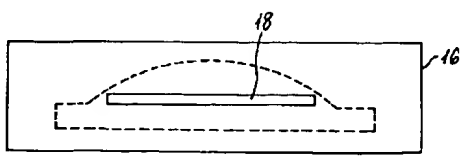
【図4】



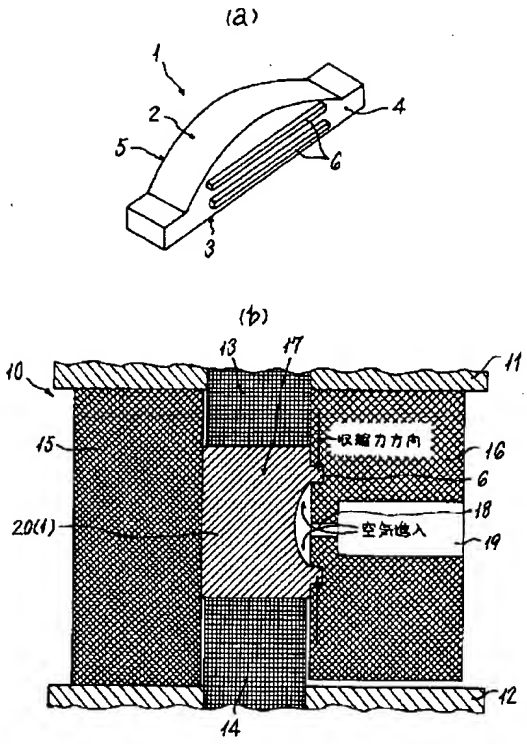
【図9】



【図13】



【図1】



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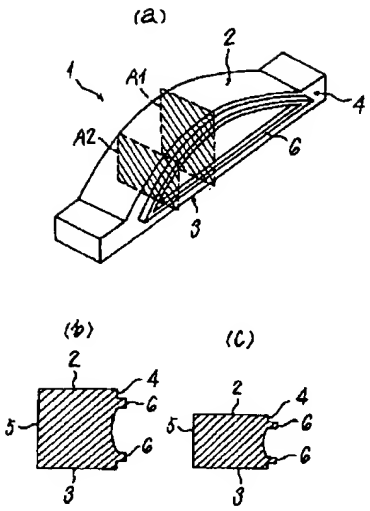

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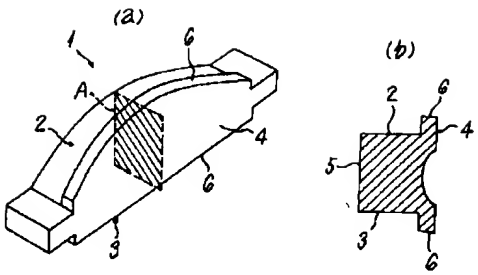

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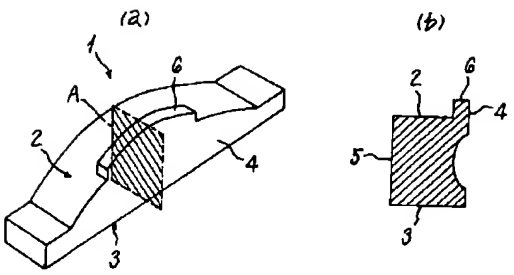

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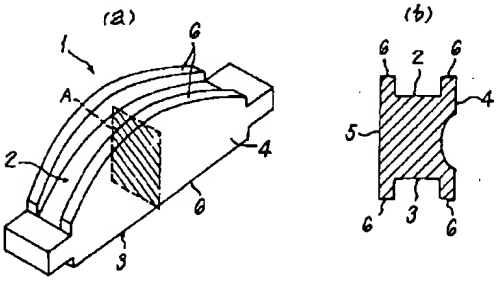

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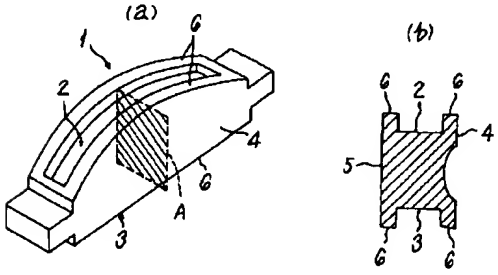

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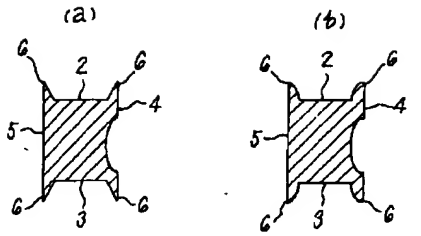
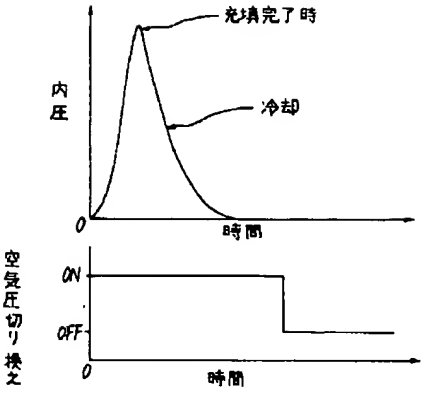


【図11】



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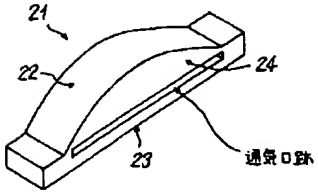
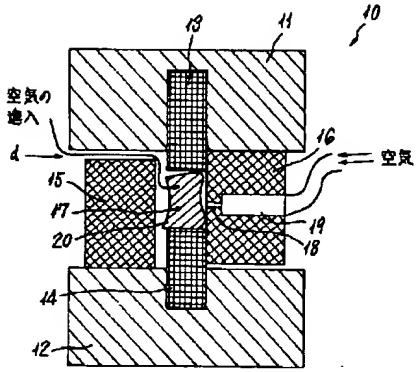
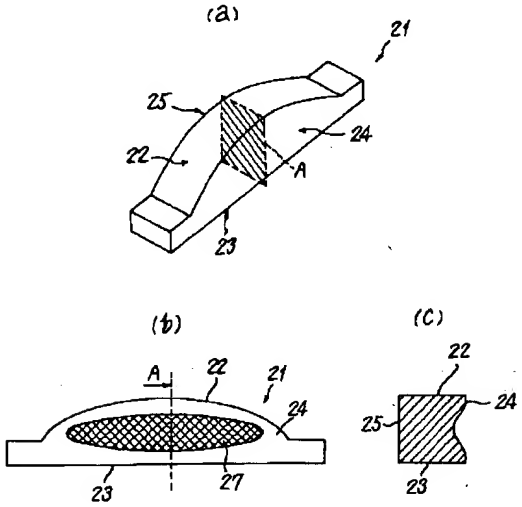


【図12】



【図14】



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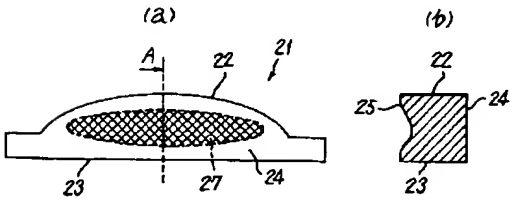
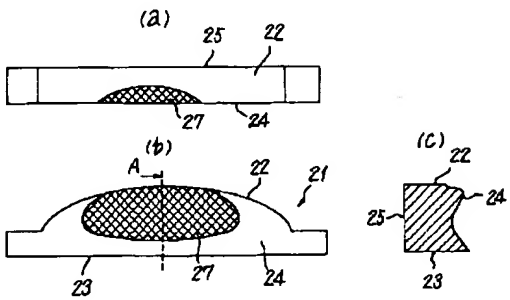


【図16】



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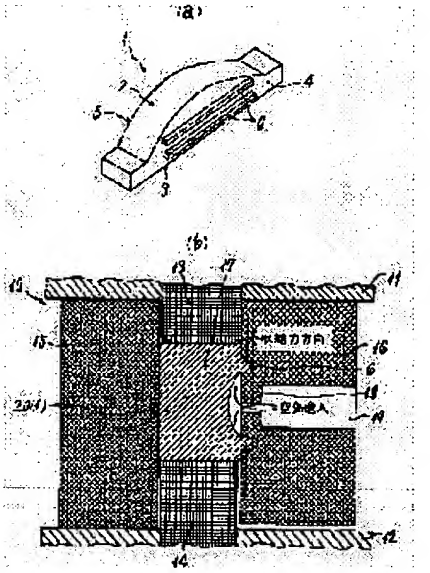
(71)Applicant : **RICOH CO LTD**
(72)Inventor : **KANEMATSU TOSHIHIRO**
YAMANAKA YASUO
MURAI MOTOYASU

(54) INJECTION MOLDED FORM AND MOLDING METHOD OF THE SAME

(57)Abstract:
PROBLEM TO BE SOLVED: To provide an injection molded form having a configuration capable of providing a sink mark at a place whereat the sink mark is required and transferring mirror surfaces surely at places whereat the transfer of mirror surfaces is required, in molding the injection molded form by employing an injection molding tool.
SOLUTION: An injection molded form 1 is molded by an injection molding tool 10 constituted so as to generate a pressure difference or an air pressure between a mirror surface part, corresponding to the mirror surface of a molding material 20 and a venting port unit, corresponding to the venting port 18 of the same, to generate a sink mark in the venting port part. In such an injection molded form 1, steps 6 are provided between the venting port 18 and the mirror surface parts 2, 3 in the cavity 17 of the injection molding tool 10. Concretely, the steps 6, intercepting between the venting port 18 and the mirror surfaces 2, 3, are provided on a surface 4 at the venting port side of the injection molding molded form 1 whereby the area of sink mark ca be controlled so as to be in the steps and the arrival of sink mark at the mirror surfaces 2, 3 can be prevented.



LEGAL STATUS

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[Date of final disposal for application]
[Patent number]
[Date of registration]
[Number of appeal against examiner's decision of rejection]
[Date of requesting appeal against examiner's decision of rejection]
[Date of extinction of right]

* NOTICES *

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention -- injection molding -- it is related with injection-molded products (a lens, a mirror, prism, etc.) and the forming methods of those, such as a plastics optical element fabricated by metal mold
[0002]
[Description of the Prior Art] injection molding which it has conventionally the forming side which forms the cavity of predetermined capacity, the imprint side which is formed in the forming side and imprints a mirror plane to mold goods, and the gate which carries out opening to a forming side in predetermined area, and injection restoration is carried out, and a melting resin is cooled through the gate in a cavity, and fabricates plastics optical elements, such as mold goods, for example, a mirror, a lens, or prism, with high precision -- metal mold is known this kind of injection molding -- the contraction at the time of a melting resin solidifying, although the homogeneity of a highly precise mirror plane or a refractive index is demanded especially of the optical element with the mold goods fabricated by metal mold -- the mirror plane which needs profile irregularity -- ********** stripes -- it might be unacquainted and there was fault
[0003] injection molding indicated by JP,3-128218,A, JP,8-234005,A, JP,3-151218,A, or JP,3-281213,A as conventional technology for canceling such fault, for example -- there are metal mold and the forming method this injection molding -- it prevents generating **** in a split-face side and carrying out ****** generating at a mirror plane according to the difference of the adhesion force with a melting resin, an imprint side, and a split face, by carrying out cooling solidification, without making into a split face the forming side which counters **:imprint side by the forming method using metal mold and its metal mold, suspending injection just before the completion of restoration of the melting resin into a cavity, and applying dwelling moreover, injection molding which generates **** in a split-face side according to the difference of the adhesion force with a melting resin, an imprint side, and a split face by carrying out cooling solidification, without suspending injection and adding dwelling when the overflow section into which a surplus melting resin flows is prepared out of a cavity and the restoration to the overflow section begins while making into a split face the forming side which counters **:imprint side at JP,3-151218,A -- metal mold and the forming method are indicated
[0004] However, if it is in such a conventional example, since the forming side which counters the imprint side of metal mold is made into a split face, although the optical element (for example, mirror) for which only one side needs a mirror plane can be fabricated, it is impossible for the formation position and the number of mirror planes of a mirror plane to be restricted, for example, to fabricate optical elements, such as a lens or prism. moreover, the material of the quality of the material which constitutes an imprint side and a split face, and a melting resin -- the adhesion force -- reversing -- a mirror plane -- ********** stripes -- it might be unacquainted and there was a problem Moreover, in above **, the adhesion force of an imprint side and a split face will be reversed, and suspending injection just before the completion of restoration will want ********** and a melting resin for a mirror plane, if the timing stopped very difficultly shifts. Moreover, although it is possible to extend the time range of the timing which suspends restoration of a melting resin in above ** Since the overflow section is fabricated by mold goods at one, while the process which removes the overflow section will be needed and becoming cost quantity When the effective-area product of the gate which makes a melting resin flow into the overflow section was too small, the adhesion force of an imprint side and a split face was reversed, and when too large, ********** and the problem that melting resins will run short were in the mirror plane.
[0005] then, injection molding which can fabricate the mold goods which have the highly precise mirror plane which these people make generate **** out of the mirror plane of mold goods, without making management of a molding material severe previously by generating an air pressure difference between the mirror-plane section of a molding material, and a predetermined part, and does not have internal distortion in order to solve such a problem -- metal mold was offered (JP,6-304973,A)
[0006] this injection molding -- metal mold with the forming side which forms the cavity of predetermined capacity, and the imprint side which is formed in these at least one or more forming sides, and imprints a mirror plane to mold goods The gate which carries out injection restoration of the molding material which carried out opening to the aforementioned forming side, and which was fused in the cavity, In metal mold injection molding which it consists of metal mold of the couple which ****, and injection restoration is carried out, and the molding material fused in the cavity is cooled through the gate, and fabricates mold goods -- At least one or more bleeders which carry out opening in predetermined area out of the imprint side of the

aforementioned forming side, at least one or more free passages which are open for free passage to this bleeder, and give predetermined pneumatic pressure to a molding material -- it is characterized by preparing a hole, generating a pressure differential between the mirror-plane section corresponding to the mirror plane of a molding material, and the bleeder section corresponding to a bleeder, and making this bleeder section generate **** namely, this injection molding -- the molding material besides the mirror plane which is imprinted by the imprint side according to metal mold -- a bleeder and a free passage, since predetermined pneumatic pressure is given to the bleeder section and a predetermined pressure differential is generated between the mirror-plane section of a molding material, and the bleeder section, while contacting air through a hole and making a cooling rate late The imprint side of metal mold can be imprinted with high precision, without being able to make the bleeder section generate **** alternatively and making the mirror-plane section generate ****. Moreover, mold goods can be fabricated, without simplifying control of the fill of the molding material into a cavity, and making the interior generate distortion, since the bleeder section is made to generate **** alternatively. Consequently, the mold goods which have a highly precise mirror plane without internal distortion can be fabricated easily.

[0007] In metal mold moreover -- JP,6-304973,A -- the aforementioned injection molding -- Forming possible [connection to the compression equipment which sends in air so that predetermined pneumatic pressure may be given to the aforementioned bleeder section of a molding material through the aforementioned bleeder for the aforementioned run through-hole] is indicated. Thus, the air pressure difference between the mirror-plane section of a molding material and the bleeder section can be arbitrarily generated with a compression equipment, and the bleeder section can be made to generate **** by forming a run through-hole possible [connection to a compression equipment]. Moreover, a mirror plane can be formed more in high degree of accuracy, without also being able to adjust the pressure differential easily and generating internal distortion.

[0008]

[Problem(s) to be Solved by the Invention] injection molding of the former [drawing 12] -- the important section cross section showing an example of metal mold -- it is -- the sign 11 in drawing -- a fixed side -- metal mold -- 12 -- a movable side -- the mirror plane which has metal mold and the imprint side where 13 and 14 imprint a mirror plane to mold goods in a forming side -- a piece -- mold goods should subtract the datum-level side nest which has the near forming side where 15 becomes the datum level (Cth page) of mold goods, and 16 -- it has a near forming side used as the field (Bth page) to carry out -- pull -- the field side nest to carry out -- it is -- such metal mold -- the cavity 17 of predetermined capacity is formed by the forming side of parts Into this cavity 17, injection restoration of the molding material (for example, melting resin) 20 fused through the gate which is not illustrated is carried out. moreover, pull -- the free passage which is open for free passage to the bleeder 18 which carries out opening in predetermined area, and this bleeder 18, and gives predetermined pneumatic pressure to the forming side of the field side nest 16 to carry out at a molding material 20 -- the hole 19 is formed pull drawing 13 the account of a top -- an example of the bleeder 18 formed in the forming side (Bth page) of the field side nest 16 to carry out is shown In addition, the aeration from a bleeder 18 has the natural ventilation using the pressure differential of the mirror-plane section and the bleeder section, and the compulsive aeration which a compression equipment (not shown) is connected [aeration] with the run through-hole 19, and generates arbitrarily the air pressure difference between the mirror-plane section of a molding material, and the bleeder section with a compression equipment.

[0009] drawing 12 and injection molding of composition of being shown in 13 -- according to metal mold 10, an injection-molded product should pull -- the side to carry out -- a bleeder 18 -- preparing -- a free passage -- it is possible to guide **** to the field by the method of making air advancing into a cavity 17 from the bleeder 18 through a hole 19 (it is referring to JP,6-304973,A for details) moreover, an injection-molded product -- a mirror plane -- the mirror plane of pieces 13 and 14 can be imprinted good, and the injection-molded product which is interior distortion of a low is obtained drawing 14 -- the above-mentioned injection molding -- it is drawing showing an example of the injection-molded product fabricated with metal mold, and (a) is [the side elevation of an injection-molded product and (c of the perspective diagram of an injection-molded product and (b))] the A section cross sections of an injection-molded product this injection-molded product 21 -- the above-mentioned injection molding -- the mirror plane of metal mold 10 -- the lens mold goods 21 should attract the side which is the example of the lens mold goods of the shape of a rectangle by which mirror planes (optical surface) 22 and 23 were imprinted by the 2nd page by pieces 13 and 14, and is shown in (b) -- it is the field (Bth page) 24 of the side to carry out, and the field of **** is shown by the amount of [which is shown with a sign 27] network line part Moreover, the Bth page of the field 25 of 24 and an opposite side is anchoring datum level (Cth page). As shown in drawing 14 , the low lens mold goods of internal distortion with which mirror planes 22 and 23 were imprinted good are obtained by [of the lens mold goods 21] guiding the Bth page of **** of an aim to 24.

[0010] however, injection molding -- the metal mold of plurality [cavity / of metal mold 10 / 17] -- it consists of parts 11-16, and when the part precision and attachment precision are bad, it is shown in drawing 12 -- as -- metal mold -- Opening d should be made in between, air should advance from the opening d, and the influx of the air into a cavity 17 should set, and attract the field of an aim -- it may carry out drawing 15 -- the influx of the air by the side of the datum level in a cavity 17 (Cth page) -- **** -- it is drawing showing an example of the lens mold goods fabricated in the state, and (a) shows the side elevation of lens mold goods, and (b) shows the A section cross section of lens mold goods it is shown in drawing 15 -- as -- the influx of the air by the side of the Cth page in a cavity 17 -- **** -- the lens mold goods 21 fabricated in the state -- ****** by the side of the field (Bth page) of an aim -- it becomes small (or pull -- it cannot carry out), and in being the worst, ****** generating is carried out and the profile irregularity as datum level falls to Cth page 25 side with reverse 24 [page / Bth]

[0011] moreover, by the method (nature and compulsion are not asked) of slushing air from a bleeder 18, to the mirror-plane

section, air should advance and pull to the mirror-plane section by the difference in a setup of the amount of resins with which it was filled up in the cavity 17, or an air content -- it may carry out Drawing 16 is drawing showing an example of the lens mold goods ****** carried out to the mirror-plane section, in (a), the plan of lens mold goods and (b) show the side elevation of lens mold goods, and (c) shows the A section cross section of lens mold goods. As air advances to the mirror-plane section at the time of injection molding and it is shown in drawing 16 , when the field 27 of **** guided to 24 the Bth page has reached the mirror-plane 22 side, distortion will arise in a mirror plane 22 and a lens performance will deteriorate.

[0012] this invention is made in view of the above-mentioned situation -- having -- the same injection molding as point ** -- in case you fabricate an injection-molded product using metal mold, pull -- attract only the part to carry out -- it carries out and a part [a part] to make it imprinting a mirror plane aims at offering the forming method of the injection-molded product which has the configuration which can be made to imprint certainly, and its injection-molded product

[0013]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, invention according to claim 1 The forming side which forms the cavity of predetermined capacity, and the imprint side which is formed in these at least one or more forming sides, and imprints a mirror plane to mold goods, The gate which carries out injection restoration of the molding material which carried out opening to the aforementioned forming side, and which was fused in the cavity, It is metal mold. injection molding which it consists of metal mold of the couple which ****, and injection restoration is carried out, and the molding material fused in the cavity is cooled through the gate, and fabricates mold goods -- At least one or more bleeders which carry out opening in predetermined area out of the imprint side of the aforementioned forming side, At least one or more run through-holes which are open for free passage to this bleeder, and give predetermined pneumatic pressure to a molding material are prepared. injection molding characterized by generating a pressure differential between the mirror-plane section corresponding to the mirror plane of a molding material, and the bleeder section corresponding to a bleeder, and making this bleeder section generate **** -- metal mold -- Or it forms possible [connection to the compression equipment which sends in air so that predetermined pneumatic pressure may be given to the aforementioned bleeder section of a molding material through the aforementioned run through-hole and a bleeder]. In the injection-molded product therefore fabricated by metal mold injection molding characterized by generating pneumatic pressure between the mirror-plane section to the mirror plane of a molding material, and the bleeder section corresponding to a bleeder, and making this bleeder section generate **** -- It is characterized by preparing a level difference between the bleeder in a cavity, and the mirror-plane section.

[0014] Invention according to claim 2 is characterized by preparing a level difference in the field by the side of the aforementioned bleeder in an injection-molded product according to claim 1. Moreover, invention according to claim 3 is set to an injection-molded product according to claim 1 or 2. It is what is characterized by preparing a level difference so that between the aforementioned bleeder and the mirror-plane sections may be interrupted. invention according to claim 4 It is what is characterized by preparing a level difference in an injection-molded product according to claim 1 or 2 so that the aforementioned bleeder may be surrounded. invention according to claim 5 In an injection-molded product according to claim 1 or 2, it is characterized by preparing the level difference of an abbreviation similarity configuration as the side configuration by the side of the aforementioned bleeder.

[0015] Invention according to claim 6 is characterized by making the aforementioned level difference convex in an injection-molded product according to claim 1, and invention according to claim 7 is characterized by making the aforementioned level difference into a concave in an injection-molded product according to claim 1.

[0016] Invention according to claim 8 is characterized by preparing a level difference in the aforementioned mirror-plane section side in an injection-molded product according to claim 1. Moreover, in an injection-molded product according to claim 1 or 8, invention according to claim 9 is characterized by preparing a level difference so that it may face across the field by the side of the straight side of the aforementioned mirror-plane section, and invention according to claim 10 is characterized by preparing a level difference so that the periphery of the aforementioned mirror-plane section may be surrounded in an injection-molded product according to claim 1 or 8.

[0017] It is what is characterized by invention according to claim 11 preparing the level difference of a taper configuration in an injection-molded product according to claim 1. invention according to claim 12 It is what is characterized by preparing a triangle-like level difference in an injection-molded product according to claim 1. invention according to claim 13 In an injection-molded product according to claim 1, it is characterized by preparing a circular level difference, and invention according to claim 14 is characterized by setting the aforementioned level difference to 0.1mm or more in an injection-molded product according to claim 1.

[0018] The forming side where invention according to claim 15 forms the cavity of predetermined capacity, The imprint side which is formed in these at least one or more forming sides, and imprints a mirror plane to mold goods, The gate which carries out injection restoration of the molding material which carried out opening to the aforementioned forming side, and which was fused in the cavity, It is metal mold. injection molding which consists of metal mold of the couple which ****, injection restoration is carried out through the gate in the molding material fused in the cavity, is cooled, and fabricates mold goods -- At least one or more bleeders which carry out opening in predetermined area out of the imprint side of the aforementioned forming side, At least one or more run through-holes which are open for free passage to this bleeder, and give predetermined pneumatic pressure to a molding material are prepared. injection molding characterized by generating a pressure differential between the mirror-plane section corresponding to the mirror plane of a molding material, and the bleeder section corresponding to a bleeder, and making this bleeder section generate **** -- metal mold -- Or it forms possible [connection to the compression equipment which sends in air so that predetermined pneumatic pressure may be

given to the aforementioned bleeder section of a molding material through the aforementioned run through-hole and a bleeder]. In the forming method which therefore fabricates mold goods to metal mold injection molding characterized by generating pneumatic pressure between the mirror-plane section to the mirror plane of a molding material, and the bleeder section corresponding to a bleeder, and making this bleeder section generate **** -- It is characterized by generating pneumatic pressure for time through a bleeder for a long time rather than the resin pressure in a cavity is set to 0. Moreover, in the forming method of an injection-molded product according to claim 15, pneumatic pressure is characterized by being 2 or less MPas by invention according to claim 16 more than atmospheric pressure (about 0.1 MPa(s)).

[0019]

[Embodiments of the Invention] Hereafter, the form of operation of this invention is explained in detail with reference to a drawing.

[0020] Drawing 17 shows the conventional injection-molded product 21 and the physical relationship of a bleeder. When a bleeder was in such a position, as it stated in the place which is a technical problem injection molding -- by the method (natural ventilation or a free passage -- the compulsive aeration which connected the compression equipment through the hole 19 not being asked) of slushing air from the bleeder 18 of metal mold 10 As air advances to the mirror-plane section by the difference in a setup of the amount of resins with which it was filled up in the cavity, or an air content and it was shown in drawing 16 , there is a possibility that the field of **** guided to 24 the Bth page may spread in a mirror-plane 22 side. In order to lose it, an injection-molded product is made into the configuration where the level difference was prepared between the bleeder in a cavity, and the mirror-plane section, in this invention (claim 1). Hereafter, the example of this invention is shown.

[0021] injection molding which fabricates the injection-molded product which drawing 1 requires for this invention, and its mold goods -- drawing showing the example of metal mold -- it is -- (a) -- the perspective diagram of an injection-molded product, and (b) -- injection molding -- it is the important section cross section of metal mold injection molding which fabricates the injection-molded product of this invention -- injection molding shown in drawing 1 (b) although the fundamental composition of metal mold is the same as that of what was shown in drawing 12 and the same sign is given to the same component part -- in metal mold 10, the level difference is prepared in the forming side between the bleeder 18 in a cavity 17, and the mirror-plane section corresponding to the level difference 6 prepared in mold goods 1 the injection-molded products 1 shown in drawing 1 (a) are the lens mold goods of the shape of a rectangle which has the 2nd page (optical surface) of the mirror planes 2 and 3 used as a lens side, and the bleeder side of the lens mold goods 1 should pull them between a bleeder 18 and mirror planes 2 and 3 -- it is the example which formed the level difference 6 which interrupts between a bleeder 18 and mirror planes 2 and 3 in the field (Bth page) 4 to carry out (claims 2 and 3) The effect of the level difference is explained below.

[0022] injection molding which fabricates the mold goods 1 of a configuration with which drawing 1 (b) has a level difference -- metal mold 10 is shown and the level difference of the reverse configuration for forming the level difference 6 by the side of mold goods 1 in the forming side between the bleeder 18 in a cavity 17 and the mirror-plane section is prepared In the cavity 17 of metal mold, since resin internal pressure is the high-pressure force immediately after filling up with the melting resin 20 which is a molding material, that air exists in a cavity 17 flows out of a bleeder 18 into the run through-hole 19 difficultly. cooling -- metal mold -- when the inner resin pressure declined, and compression pouring of the air is carried out through a hole 19 and a bleeder 18 and it becomes atmospheric pressure or below a compression pressure a compression equipment -- a free passage, air flows from a bleeder 18 and a resin 20 begins (generating of ****) to separate from the bleeder 18 of metal mold pull, when there is no level difference in mold goods at this time -- although ** and also growth may be continued and it may attain to the mirror-plane section, in the configuration where the Bth page of the level difference 6 by the side of the bleeder of mold goods 1 which interrupts between a bleeder and mirror planes 2 and 3 was formed in 4 like drawing 1 (a), it is going to contract the level difference portion in the direction of an arrow of drawing 1 (b) however, metal mold -- in order to interfere with a near level difference, contraction of a level difference portion does not advance therefore, a resin and metal mold should stick and pull -- it does not grow up more than ******, but the field of **** can be controlled in a level difference this should pull -- attract only the part to carry out -- it carries out and the lens mold goods 1 which made mirror planes 2 and 3 imprint certainly are obtained

[0023] Next, drawing 2 is the perspective diagram of the injection-molded product in which another example of this invention is shown. In this example, a level difference 6 is arranged so that the surroundings of a bleeder may be surrounded in B page 4 by the side of the bleeder of the lens mold goods 1 of the same configuration as drawing 1 (a) (claim 4). Thus, by arranging a level difference 6 so that the surroundings of a bleeder may be surrounded, the wraparound of air is lost as compared with drawing 1 (a), and the field of **** can be controlled more certainly.

[0024] Next, drawing 3 is explanatory drawing of the injection-molded product in which another example of this invention is shown, and (a) is [A1 section cross section of an injection-molded product and (c of the perspective diagram of an injection-molded product and (b))] A2 section cross sections of an injection-molded product. In this example, the level difference 6 of an abbreviation similarity configuration is formed in the side 4 (Bth page) by the side of the bleeder of the mold goods 1 of the same lens configuration as drawing 1 (a) as the side configuration (claim 5). More specifically, as shown in drawing 3 , when mold goods 1 are rectangle-like lenses, the level difference 6 of an abbreviation similarity configuration is formed as a lens side configuration so that the surroundings of a bleeder may be surrounded in the field 4 by the side of a bleeder (Bth page). thereby, the same as the cross section of each cross section (example: -- A1 shown in drawing 3 (b) and (c), and A2 section cross section) of mold goods 1 -- come out comparatively and pull -- since a field is controllable, internal

distortion and equalization of profile irregularity are attained, and it becomes highly precise lens mold goods
[0025] although the example made convex as shown in the cross section of drawing 4 (a) showed the configuration of the height direction of the level difference 6 of an injection-molded product 1 in each above-mentioned example, pull also as a concave level difference as shown in the cross section of this drawing (b) -- it has the effect which can control a field similarly (claims 6 and 7) however, the case where a convex level difference is prepared in the field 4 by the side of the bleeder of mold goods 1 (Bth page) -- injection molding -- the case where prepare the concave level difference in the forming side of the bleeder 18 circumference of metal mold 10, and a concave level difference is prepared in the field 4 by the side of the bleeder of mold goods 1 (Bth page) -- injection molding -- the convex level difference will be prepared in the forming side of the bleeder 18 circumference of metal mold 10
[0026] Next, the case where a level difference is prepared in the mirror-plane side of an injection-molded product is explained. drawing 5 should be explanatory drawing of the injection-molded product in which another example of this invention is shown, it is the perspective diagram of an injection-molded product, (b) is the A section cross section of an injection-molded product, and an injection-molded product 1 should pull (a) -- it is the example which formed the level difference 6 in the mirror-plane sections 2 and 3 of the side to carry out (claim 8) in order to intercept penetration of the air from a bleeder, an injection-molded product 1 should pull like drawing 5 -- the mirror-plane sections 2 and 3 of the side to carry out -- a level difference 6 -- you may prepare -- the time of injection molding -- the level difference 6 of mold goods 1, and metal mold -- since a near level difference sticks, penetration of the air to the mirror-plane sections 2 and 3 can be prevented, and it can prevent carrying out ****** generating in the mirror-plane section
[0027] drawing 6 should be explanatory drawing of the injection-molded product in which another example of this invention is shown, it is the perspective diagram of an injection-molded product, (b) is the A section cross section of an injection-molded product, and an injection-molded product 1 should pull (a) -- it is the example which formed the level difference 6 in a part of mirror-plane sections 2 and 3 of the side to carry out it was shown in drawing 16 -- as -- a part of mirror plane of mold goods -- air -- a wraparound part -- ********** -- when things are understood, some level differences 6 prepared in the part which has a possibility that **** of the mirror-plane sections 2 and 3 may come out, like drawing 6 are sufficient In this case, since a level difference is a part, the conversion cost at the time of forming a level difference in metal mold is made at a low price.
[0028] Drawing 7 is explanatory drawing of the injection-molded product in which another example of this invention is shown, (a) is the perspective diagram of an injection-molded product, and (b) is the A section cross section of an injection-molded product, and as it faces across the field by the side of the straight side of the mirror planes 2 and 3 of an injection-molded product 1, it is the example which formed the level difference 6 in the Bth page 4 of mirror planes 2 and 3, and Cth page 5 side (claim 9). Although air may flow and ****** generating may be carried out at a datum-clamp-face (Cth page) side as there is a possibility of advancing from the part which cannot predict air, for example, it was shown in drawing 15 when the attachment precision of metal mold 10 is bad as shown in drawing 12 , the air turns to the mirror-plane section, and ****** generating may be carried out also at the mirror-plane section. By forming a level difference 6 in the both sides of mirror planes 2 and 3 like drawing 7 for this solution, the wraparound of the air to the mirror-plane section can be prevented, and it can prevent carrying out ****** generating in the mirror-plane section.
[0029] Drawing 8 is explanatory drawing of the injection-molded product in which another example of this invention is shown, (a) is the perspective diagram of an injection-molded product, (b) is the A section cross section of an injection-molded product, and it is the example which formed the level difference 6 so that the periphery of the mirror-plane sections 2 and 3 of an injection-molded product 1 might be surrounded (claim 10). Thus, penetration of air can be more certainly prevented by forming a level difference 6 so that the periphery of the mirror-plane sections 2 and 3 may be surrounded, and it can prevent carrying out ****** generating certainly in the mirror-plane section.
[0030] In order to prevent penetration of the air to the mirror-plane sections 2 and 3 of an injection-molded product 1, there should just be even a level difference configuration as shown in drawing 7 (b) and drawing 8 (b). However, like [when the mold-release characteristic from metal mold is taken into consideration] the example shown in drawing 9 , if the level difference 6 of the taper-like draft is formed to level difference height h, it can release from mold from metal mold well (claim 11), without worsening the configuration precision of mold goods.
[0031] Moreover, form the triangle-like level difference 6 in the both sides of the mirror-plane sections 2 and 3 of an injection-molded product 1 like the example shown in drawing 10 (a) (claim 12). or the thing for which the circular level difference 6 is formed in the both sides of the mirror-plane sections 2 and 3 of an injection-molded product 1 like the example shown in drawing 10 (b) (claim 13) -- a mirror plane besides improvement in a mold-release characteristic -- a piece 13, 14 grades, and metal mold -- processing at the time of forming a level difference in a side can be simplified
[0032] In addition, height h of the level difference 6 prepared in an injection-molded product 1 could be h= 0.1mm or more (claim 14). That is, this invention persons checked experimentally that the effect of air interception was acquired enough, when level difference height was 0.1mm or more.
[0033] next, injection molding of composition of that the forming method of the injection-molded product concerning this invention is shown in drawing 1 (b) -- the example which used metal mold explains first, a mirror plane -- pull with a piece 13 -- the fixed side equipped with the field side nest 16 to carry out -- metal mold 11 -- receiving -- a mirror plane -- the movable side equipped with the piece 14 and the datum-level side nest 15 -- the cavity 17 of predetermined capacity is formed by the forming side of the metal mold of a couple by sticking metal mold 12 and mold-clamp carrying out injection molding -- in order to carry out injection restoration of the molding material fused in the cavity 17, the gate which was outside open for free

passage is established in the near forming side where metal mold 10 is not illustrated, the well-known injection restoration machine which is not illustrated is connected with this gate, and injection restoration of the melting resin 20 which is a molding material is carried out into a cavity 17 by this injection restoration machine In the cavity 17 of metal mold 10, since resin internal pressure is the high-pressure force immediately after filling up with the melting resin 20 which is a molding material, existing in a cavity 17 is difficult for air, and it flows out of a bleeder 18. cooling of the melting resin 20 -- metal mold -- when the inner resin pressure declined, and compression pouring of the air is carried out through a hole 19 and a bleeder 18 and it becomes atmospheric pressure or below a compression pressure the compression equipment which is not illustrated -- a free passage, a resin 20 begins to separate from the bleeder 18 of metal mold, and air flows from a bleeder 18 (generating of ****) although the level difference portion is contracted in the direction of an arrow of drawing 1 (b) in the configuration where the level difference 6 which interrupts between the mirror-plane sections 2 and 3 to the field 4 by the side of the bleeder of mold goods 1 (Bth page) was formed as shown at this time (a), for example, drawing 1 , -- metal mold -- in order to interfere with a near level difference, contraction of a level difference portion does not advance therefore, a resin and metal mold should stick and pull -- it does not grow up more than ******, but the field of **** can fabricate the mold goods controlled in the level difference

[0034] Here, drawing 11 is drawing showing the pneumatic pressure switch timing in the case of pouring in the compressed air from a bleeder 18 with the resin internal pressure in the cavity of a before [from the restoration start of a melting resin / the completion of cooling]. When pouring in the compressed air from a bleeder 18, passing air is continued till more than the time of the resin internal pressure in a cavity 17 being set to 0, and the bleeder section is made to generate pneumatic pressure by the forming method of this invention, as shown in drawing 11 (claim 15). this invention persons need to attract time certainly by generating pneumatic pressure through a bleeder 18 for a long time rather than the resin pressure in a cavity 17 is set to 0 in this way -- it checked experimentally that a field was controllable

[0035] pull by applying 5 more second or more pneumatic pressure, after resin internal pressure is set to 0 in a lens configuration as it is required to apply pneumatic pressure for a long time somewhat from the time of internal pressure 0 in order to have stuck the resin to metal mold until the resin internal pressure in a cavity is set to 0, and to carry out ****** growth in time beyond it, for example, the injection-molded product 1 showed in the example -- control of a field was completed Moreover, as for the pneumatic pressure at that time, control sufficient by 2 or less MPas is obtained more than atmospheric pressure (about 0.1 MPa(s)) (claim 16).

[0036] In addition, although the example explained above showed the example which used the rectangle-like lens (thing with the 2nd page (optical surface) of a mirror plane) as an injection-molded product 1, this invention cannot be restricted to this and it can be coped with by preparing the level difference of a view with the same said also of what has one mirror plane (optical surface) like a mirror and the thing which has two or more mirror planes (optical surface) like prism, and a configuration.

[0037]

[Effect of the Invention] As explained above, in invention according to claim 1 In the injection-molded product formed by metal mold injection molding of composition of generating a pressure differential or pneumatic pressure between the mirror-plane section corresponding to the mirror plane of a molding material and the bleeder section corresponding to a bleeder, and making this bleeder section generate **** -- by having prepared the level difference between the bleeder in a cavity, and the mirror-plane section, contraction of a resin should advance and subtract from a level difference portion at the time of cooling of a resin -- the resin of portions other than the field to carry out and adhesion of metal mold are maintained, and the field of **** cannot grow more than a level difference, but can control the field of **** in a level difference

[0038] The field of **** is controllable by invention according to claim 2 in the field by the side of a bleeder by having prepared the level difference in the field by the side of a bleeder of an injection-molded product. In invention according to claim 3, it can prevent ****** making it a mirror plane by having prepared the level difference so that between the aforementioned bleeder and the mirror-plane sections might be interrupted. in invention according to claim 4, by having prepared the level difference so that the aforementioned bleeder might be surrounded, prevent the wraparound of the air to the mirror-plane section, and pull -- a field can be controlled in the level difference of the field by the side of a bleeder, and it can prevent ****** making it a mirror plane certainly invention according to claim 5 -- the side configuration by the side of the aforementioned bleeder, and abbreviation -- an analog -- the same as the cross section of mold goods by having prepared the level difference of a ** -- come out comparatively and pull -- since a field is controllable, internal distortion and equalization of profile irregularity are attained, and highly precise mold goods are obtained

[0039] in invention according to claim 6, although the level difference of an injection-molded product was made convex and the aforementioned level difference was made into the concave in invention according to claim 7, in any case, pull -- the effect which can control a field can be acquired

[0040] In invention according to claim 8, by having prepared the level difference in the mirror-plane section side of an injection-molded product, the penetration to the mirror-plane section of the air from a bleeder can be intercepted, and generating of **** in the mirror-plane section can be prevented. In invention according to claim 9, the penetration to the mirror-plane section of the air from a bleeder or the air around which it turns from other parts can be intercepted by having prepared the level difference so that it may face across the field by the side of the straight side of the aforementioned mirror-plane section, and generating of **** in the mirror-plane section can be prevented certainly. In invention according to claim 10, by having prepared the level difference so that the periphery of the aforementioned mirror-plane section might be surrounded, penetration of the air to the mirror-plane section can be prevented more certainly, and generating of **** in the

mirror-plane section can be prevented more certainly.
[0041] In invention according to claim 11, the mold-release characteristic from metal mold can be improved by having prepared the level difference of a taper configuration in the injection-molded product, without being able to control the field of **** in a level difference, and worsening the configuration precision of mold goods. moreover, the thing for which the shape of a triangle and a circular level difference are prepared in an injection-molded product like invention of a claim 12 and 13 publications -- metal mold besides improvement in a mold-release characteristic -- processing at the time of forming a level difference in a side can be simplified In addition, like invention according to claim 14, if the aforementioned level difference is 0.1mm or more, the effect of air interception will be acquired enough.
[0042] injection molding of composition of generating a pressure differential or pneumatic pressure between the mirror-plane section corresponding to the mirror plane of a molding material and the bleeder section corresponding to a bleeder, and making this bleeder section generate **** in invention according to claim 15 -- in case you fabricate an injection-molded product with metal mold, attract time certainly by generating pneumatic pressure through a bleeder for a long time rather than the resin pressure in a cavity is set to 0 -- a field is controllable moreover, like invention according to claim 16, if the aforementioned pneumatic pressure is 2 or less MPas more than atmospheric pressure (about 0.1 MPa(s)), fully pull it -- a field is controllable

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[Translation done.]

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CLAIMS

[Claim(s)]
[Claim 1] The forming side which forms the cavity of predetermined capacity. The imprint side which is formed in these at least one or more forming sides, and imprints a mirror plane to mold goods. The gate which carries out injection restoration of the molding material which carried out opening to the aforementioned forming side, and which was fused in the cavity. It is the injection-molded product equipped with the above, and is characterized by preparing a level difference between the bleeder in a cavity, and the mirror-plane section.
[Claim 2] The injection-molded product according to claim 1 characterized by preparing a level difference in the field by the side of the aforementioned bleeder.
[Claim 3] The injection-molded product according to claim 1 or 2 characterized by preparing a level difference so that between the aforementioned bleeder and the mirror-plane sections may be interrupted.
[Claim 4] The injection-molded product according to claim 1 or 2 characterized by preparing a level difference so that the aforementioned bleeder may be surrounded.
[Claim 5] The injection-molded product according to claim 1 or 2 characterized by preparing the level difference of an abbreviation similarity configuration as the side configuration by the side of the aforementioned bleeder.
[Claim 6] The injection-molded product according to claim 1 characterized by making the aforementioned level difference convex.
[Claim 7] The injection-molded product according to claim 1 characterized by making the aforementioned level difference into a concave.
[Claim 8] The injection-molded product according to claim 1 characterized by preparing a level difference in the aforementioned mirror-plane section side.
[Claim 9] The injection-molded product according to claim 1 or 8 characterized by preparing a level difference so that it may face across the field by the side of the straight side of the aforementioned mirror-plane section.
[Claim 10] The injection-molded product according to claim 1 or 8 characterized by preparing a level difference so that the periphery of the aforementioned mirror-plane section may be surrounded.
[Claim 11] The injection-molded product according to claim 1 characterized by preparing the level difference of a taper configuration.
[Claim 12] The injection-molded product according to claim 1 characterized by preparing a triangle-like level difference.
[Claim 13] The injection-molded product according to claim 1 characterized by preparing a circular level difference.
[Claim 14] The injection-molded product according to claim 1 characterized by setting the aforementioned level difference to 0.1mm or more.
[Claim 15] The forming side which forms the cavity of predetermined capacity. The imprint side which is formed in these at least one or more forming sides, and imprints a mirror plane to mold goods. The gate which carries out injection restoration of the molding material which carried out opening to the aforementioned forming side, and which was fused in the cavity. It is the forming method of the injection-molded product equipped with the above, and it is characterized by generating pneumatic pressure for time through a bleeder for a long time rather than the resin pressure in a cavity is set to 0.
[Claim 16] Pneumatic pressure is the forming method of the injection-molded product according to claim 15 characterized by being 2 or less MPas more than atmospheric pressure (about 0.1 MPa(s)).

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] injection molding which fabricates the injection-molded product concerning this invention, and its mold goods -- drawing showing the example of metal mold -- it is -- (a) -- the perspective diagram of an injection-molded product, and (b) -- injection molding -- it is the important section cross section of metal mold
[Drawing 2] It is the perspective diagram of the injection-molded product in which another example of this invention is shown.
[Drawing 3] It is explanatory drawing of the injection-molded product in which another example of this invention is shown, and (a) is [A1 section cross section of an injection-molded product and (c of the perspective diagram of an injection-molded product and (b))] A2 section cross sections of an injection-molded product.
[Drawing 4] It is drawing showing the example of a configuration of the height direction of the level difference of the injection-molded product concerning this invention.
[Drawing 5] It is explanatory drawing of the injection-molded product in which another example of this invention is shown, and (a) is the perspective diagram of an injection-molded product, and (b) is the A section cross section of an injection-molded product.
[Drawing 6] It is explanatory drawing of the injection-molded product in which another example of this invention is shown, and (a) is the perspective diagram of an injection-molded product, and (b) is the A section cross section of an injection-molded product.
[Drawing 7] It is explanatory drawing of the injection-molded product in which another example of this invention is shown, and (a) is the perspective diagram of an injection-molded product, and (b) is the A section cross section of an injection-molded product.
[Drawing 8] It is explanatory drawing of the injection-molded product in which another example of this invention is shown, and (a) is the perspective diagram of an injection-molded product, and (b) is the A section cross section of an injection-molded product.
[Drawing 9] It is drawing showing another example of this invention, and is the cross section of the injection-molded product which prepared the level difference of a taper configuration.
[Drawing 10] It is drawing showing another example of this invention, and the cross section of the injection-molded product with which (a) prepared the triangle-like level difference, and (b) are the cross sections of the injection-molded product which prepared the circular level difference.
[Drawing 11] It is drawing showing the pneumatic pressure switch timing in the case of pouring in the compressed air from a bleeder with the resin internal pressure in the cavity of a before [from the restoration start of a melting resin / the completion of cooling].
[Drawing 12] the conventional injection molding -- it is the important section cross section showing an example of metal mold

[Drawing 13] injection molding shown in drawing 12 -- metal mold should pull -- it is the plan showing an example of the bleeder formed in the forming side of the field side nest to carry out
[Drawing 14] injection molding shown in drawing 12 -- it is drawing showing an example of the injection-molded product fabricated with metal mold, and (a) is [the side elevation of an injection-molded product and (c of the perspective diagram of an injection-molded product and (b))] the A section cross sections of an injection-molded product
[Drawing 15] the influx of the air by the side of the datum level in a cavity -- **** -- it is drawing showing an example of the injection-molded product fabricated in the state, and (a) is the side elevation of an injection-molded product, and (b) is the A section cross section of an injection molded product
[Drawing 16] It is drawing showing an example of the injection-molded product ****** carried out to the mirror-plane section, and (a) is [the side elevation of an injection-molded product and (c of the plan of an injection-molded product and (b))] the A section cross sections of an injection-molded product.
[Drawing 17] injection molding shown in drawing 12 -- it is drawing showing the physical relationship of the injection-molded product fabricated with metal mold, and a bleeder
[Description of Notations]
1: Injection-molded product (lens mold goods)
2 Three: Mirror plane (optical surface)

4: The field by the side of a bleeder (pull field to carry out (Bth page))
5: Anchoring datum level (Cth page)
6: Level difference
10: injection molding -- metal mold
11: a fixed side -- metal mold
12: a movable side -- metal mold
13 and 14:mirror plane -- a piece
15: Datum-level side nest
16: pull -- the field side nest to carry out
17: Cavity
18: Bleeder
19: Run through-hole
20: Molding material (melting resin)

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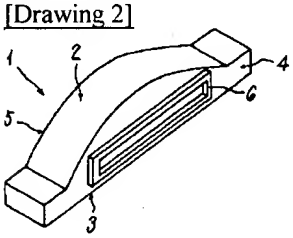
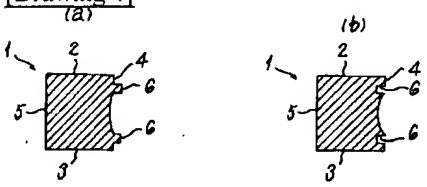
DRAWINGS

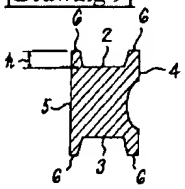
[Drawing 2]



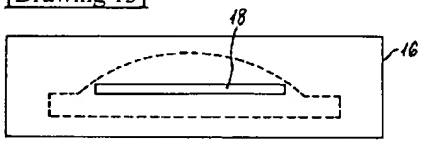
[Drawing 4]



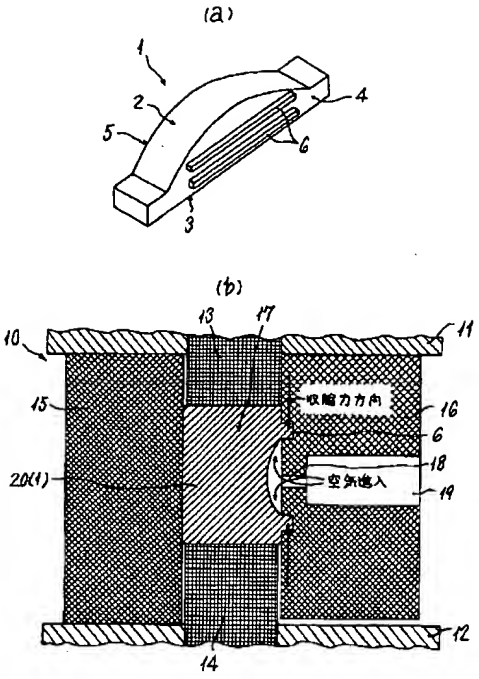
[Drawing 9]



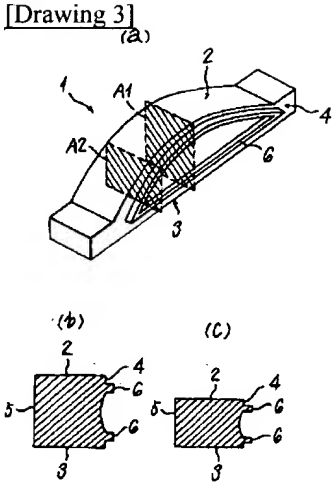
[Drawing 13]



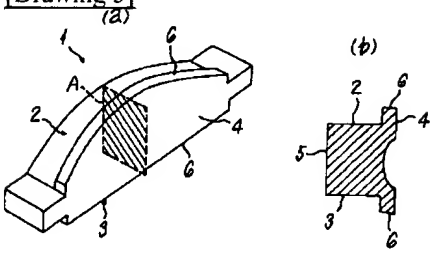
[Drawing 1]



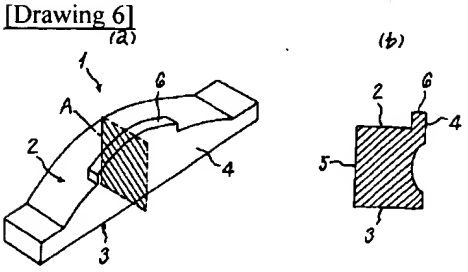
[Drawing 3]



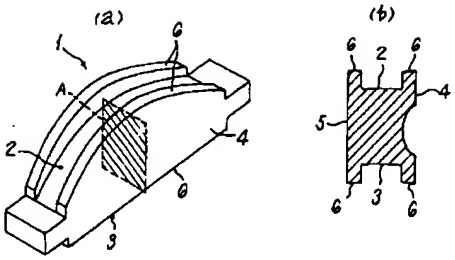
[Drawing 5]



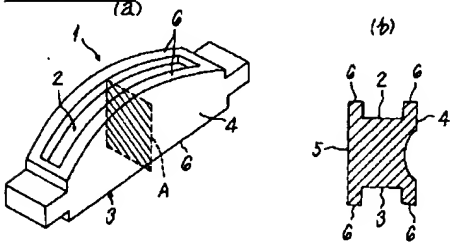
[Drawing 6]



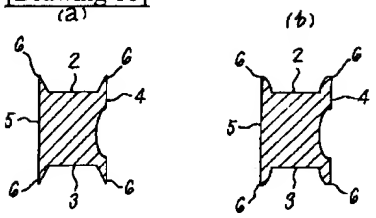
[Drawing 7]



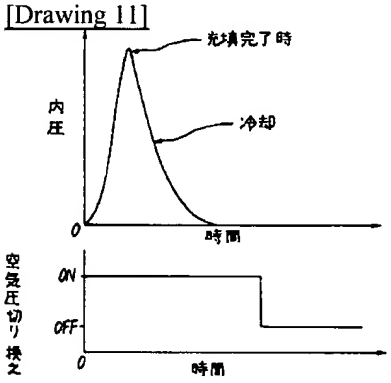
[Drawing 8]



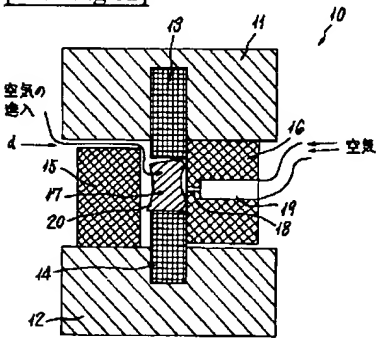
[Drawing 10]



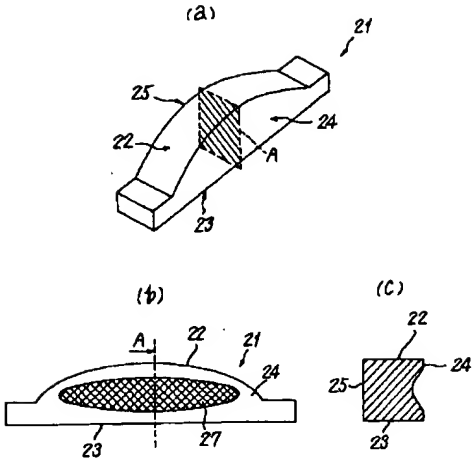
[Drawing 11]



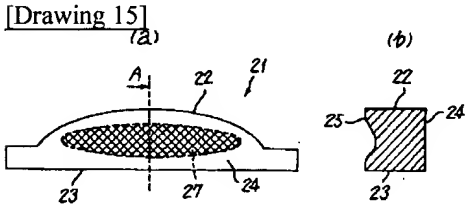
[Drawing 12]



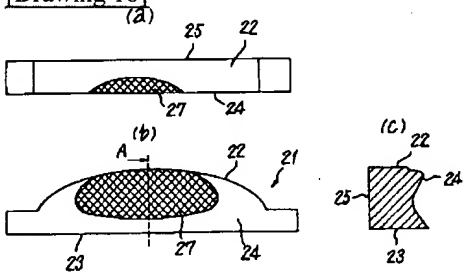
[Drawing 14]



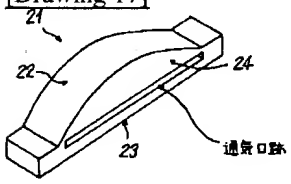
[Drawing 15]



[Drawing 16]



[Drawing 17]



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